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* TRANSFERRED DURING 1998

** ACTIVE DUTY TRAINING

EXECUTIVE SUMMARY

The 1998 tropical cyclone forecasting season was one of the most challenging in the 39-year history of the Joint Typhoon Warning Center (JTWC) due to the nature of the forecast season and the move of JTWC from Guam to Hawaii. In terms of forecast difficulty, the 1998 Western Pacific (WESTPAC) season was one of the toughest in the past two decades based upon the performance of the Climatology and Persistence (CLIPER) model (which provides us a baseline against which to measure our forecast skill). We also noted a number of anomalies in WESTPAC, many of which could be traced to the well-documented La Nina event that was on-going throughout the season. First, we had a very late start to the season. Our initial named storm, Tropical Storm Nichole, did not occur until 7 July. This was the latest occurrence for a named storm since JTWC has been keeping records (1959). We also had fewer tropical cyclones (tropical depressions and storms, typhoons and super-typhoons) than average with 27 in 1998 versus an average of approximately 31. The tropical cyclones that occurred also tended to be less intense than average. In 1998, we had 9 Tropical Depressions (TD), 9 Tropical Storms (TS), and 9 Typhoons (TY). We would expect an average (again, approximate) of 4 TD, 10 TS, and 18 TY. We definitely experienced a much higher percentage of TDs than usual and a significantly lower percentage of typhoons. The genesis areas for the storms was also substantially displaced to the west with a higher percentage of the storms forming in the South China Sea and fewer east of Guam than we normally expect. This point is amplified later in the report. Additionally, JTWC faced the daunting task of transferring operations from the Naval Pacific Meteorology and Oceanography Center West/Joint Typhoon Warning Center, Guam to the Naval Pacific Meteorology and Oceanography Center/Joint Typhoon Warning Center, Pearl Harbor, Hawaii in order to meet the requirements of Base Relocation and Closure legislation. In accomplishing the move, a number of challenges were overcome with outstanding results due to the dedication and devotion to duty of the airmen and sailors assigned to both commands. JTWC gradually shifted operations to Pearl Harbor over a two-month period (Nov-Dec, 98). This required JTWC to conduct split operations with a portion of forecasting watches occurring at Pearl Harbor and the rest in Guam. By 1 Jan 99, the move was complete and all watches were being stood in Hawaii. All the required equipment to support the tropical cyclone forecasting and Meteorological Satellite (METSAT) reconnaissance missions was transferred from Guam to Hawaii. Meanwhile, our METSAT personnel took on the added challenge of incorporating a new primary METSAT fixing system (NSDS-E) into their daily operations. On the Air Force side of JTWC, a new detachment was established under the Headquarters Pacific Air Forces Air Operations Squadron under the command of the JTWC Director. The majority of JTWC personnel reported directly to the new duty location in Pearl Harbor, Hawaii. As a result, JTWC experienced a 90 percent turnover in personnel starting in June, 1998. Again, the outstanding performance of JTWC personnel during an incredibly challenging season can not be overstated. What also can not be overstated is the significant contribution to JTWC operations from those in the research and support communities. Without the contributions of these unsung heroes, the challenging task of locating and forecasting the movement of tropical cyclones would be an impossible task. In the upcoming year, we pledge to leverage all available technology and science to continue to provide the best possible support to you, our customers.

FORWARD

The Annual Tropical Cyclone Report is prepared by the staff of the Naval Pacific Meteorology and Oceanography Center/Joint Typhoon Warning Center (JTWC), a joint Navy/Air Force organization. In 1998, the period covered by this report, JTWC operated under the command of the Commanding Officer, Naval Pacific Meteorology and Oceanography Center West (NAVPACMETOCCEN WEST)/Joint Typhoon Warning Center, Guam. In January of 1999, however, JTWC completed the transition from Guam to Pearl Harbor, Hawaii, as mandated by the 1995 Base Realignment And Closure Commission (BRAC), and now operates under the command of Commanding Officer, Naval Pacific Meteorology and Oceanography Center (NAVPACMETOCCEN)/Joint Typhoon Warning Center, Pearl Harbor, Hawaii. This move ends the nearly forty-year history of JTWC on Guam, which began on 01 May 1959 when the U.S. Commander in Chief Pacific (USCINCPAC) directed that a single tropical cyclone warning center be established for the North Western Pacific. No matter where JTWC is located, our customers will continue to receive the same dedicated support they have come to expect.

The mission of JTWC as directed by USCINCPAC Instruction 3140.1W (series) is multifaceted and includes:

1. Continuous monitoring of all tropical weather activity in the Northern and Southern Hemispheres, from 180 east longitude westward to the east coast of Africa, and the prompt issuance of appropriate advisories and alerts when tropical cyclone development is anticipated.
2. Issuance of warnings on all significant tropical cyclones in the above area of responsibility.
3. Determination of requirements for tropical cyclone reconnaissance and assignment of appropriate priorities.
4. Post-storm analysis of significant tropical cyclones occurring within the North Western Pacific and North Indian Oceans.
5. Cooperation with the Naval Research Laboratory, Monterey, California on evaluation of tropical cyclone models and forecast aids, and the development of new techniques to support forecast requirements.

Special thanks is extended to the following organizations for the timely operational support of the JTWC mission:

Alternate Joint Typhoon Warning Center (NAVPACMETOCCEN Pearl Harbor) Fleet Numerical Meteorology and Oceanography Center Air Force Weather Agency NOAA Satellite Data and Information Service 36th Communications Squadron Operations and Equipment Support Departments of both NAVPACMETOCCEN/JTWC Pearl Harbor and NAVPACMETOCCEN/JTWC Guam.

We also wish to thank the Office of Naval Research, Naval Research Laboratory, Monterey and Naval Postgraduate School for the tremendous research and development support. Of specific note, we would like to thank the following individuals:

Drs. Lester E. Carr III and Russell L. Elsberry for their continuing work on the Systematic and Integrated Approach to Tropical Cyclone Forecasting. Messrs. Jeff D. Hawkins, Chris S. Veldon, et. Al., for their continuing efforts to exploit remote sensing technologies. Mr. Charles R. "Buck" Sampson and Ms. Ann Schrader, et. Al., for their constant support and continued development of the Automated Tropical Cyclone Forecasting System.